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HOME PREPARATION OF JELLY AND MARMALADE

W. V. CRUESS* AND J. H. IRISH†

Surplus fruits from the farm orchard can often be converted into jelly or marmalade for home use at small cost and some times part of the product can be sold locally at a profit. City housewives can often purchase fruits cheaply during the height of the season for the same purpose.

Characteristics of a Good Jelly or Marmalade.—A good jelly is clear, of attractive color, and free from sediment or crystals. When removed from the glass it retains its form, yet quivers when touched. It is tender, not tough nor gummy, and when cut, a smooth sparkling surface remains. It is not syrupy, yet spreads smoothly on bread. The flavor and odor should be pleasing and characteristic of the fruit from which the jelly is made.

Marmalade is a tender jelly in which pieces of thinly sliced fruit or peel are imbedded. It should possess the characteristics of a good jelly previously noted.

GENERAL PRINCIPLES

In addition to water, three substances, pectin, acid, and sugar, are essential to the formation of true fruit jelly.

Pectin.—The actual jellying substance is pectin. Without it a true fruit jelly cannot be made.

Pure pectin when extracted, is a white powder which makes a sticky solution with water. Powdered pectin and pectin syrups are on the market and can be purchased with directions for household use. The product obtained from different sources and prepared in different ways varies greatly in its jellying power, a fact which makes it difficult to standardize directions for the use of commercial pectins.

It is possible to prepare home made pectin extracts in the kitchen without special equipment. Directions will be found on page 19.

Pectin is found in all fruits, but some contain very much more than others. It is closely related to pectose, the substance which

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is chiefly responsible for the hard texture of green fruits. Ripening of the fruit or boiling causes the pectose, an insoluble substance, to be converted into pectin, which is soluble. When fruit becomes overripe, much of the pectin is changed to pectic acid, which is practically insoluble and has no jellying power in the usual sense of the term. Prolonged boiling of pectin also changes it to pectic acid. These facts explain why it is desirable to boil firm fruits to obtain a juice rich in pectin, why overripe fruits are unsuitable for jelly making and why excessively prolonged boiling of jelly may result in failure.

Fruit juices vary greatly in the amount of pectin they contain. A certain minimum amount must be present in the juice before it will form jelly, about .5 to 1.0 per cent, according to the quality of the pectin. The addition of sugar increases the volume of jelly and thus dilutes the pectin. Less sugar, therefore, should be added to a juice low in pectin than to one high in pectin.

Acid.—It is well known that juices high in acid (sour juices) are more suitable for jelly making than those deficient in acid. Some varieties of fruits such as figs, bananas and Bartlett pears naturally contain little acid, and their juices will not form jelly unless an acid such as citric or a sour juice such as lemon is added. Some varieties of fruit particularly apples and blackberries have sufficient acid when firm-ripe or slightly underripe, but are deficient in acid when soft-ripe.

Sugar.—Without sugar of some kind true fruit jelly will not form. Any of the common sugars may be used. Beet sugar is as good as cane sugar for jelly making. The two sugars are identical chemically and in their behavior in jelly-making. Failures in jelly making cannot be ascribed to the use of beet sugar.

Corn sugar, corn syrup, or honey may be substituted in part for cane or beet sugar. About two-thirds of a cup of honey is equivalent to one cup of sugar.

Again it must be emphasized that the amount of sugar, not the kind of sugar, is the important factor. Very few juices are rich enough in pectin and acid to form jelly with one cup of sugar to one of juice. Usually less sugar than this must be used. The addition of too much sugar is the most common cause of jelly failure.

Boiling.—The primary purpose of boiling is to concentrate the pectin, acid, and sugar by evaporation of excess water to the point where jellying will occur on cooling. This point will vary considerably according to the concentration of pectin and acid and the proportion of sugar used, but usually corresponds to about 65–70 per cent of sugar. The addition of one cup of sugar to one of juice gives a

sweetened juice of about 55 per cent of sugar. To form jelly it is necessary to remove enough water by boiling to decrease the volume of the juice from one-fourth to one-third, thus concentrating the sugar to 65–70 per cent. Boiling should be rapid so that the jellying point can be reached quickly, because prolonged boiling destroys color, flavor and pectin and often results in jelly failure. Too little boiling may also result in failure because the pectin and sugar will not be sufficiently concentrated.

TABLE 1

CLASSIFICATION OF FRUITS ACCORDING TO SUITABILITY FOR JELLY MAKING

Fruits rich in acid and pectin	Fruits rich in pectin but deficient in acid	Fruits rich in acid but deficient in pectin	Fruits deficient in both acid and pectin
Sour apples, including crabapples.	Figs (unripe).	Pomegranate.	Raspberries.
Sour blackberries.	Bananas (unripe).	Strawberries.	Peaches.
Currants (red).	Apples, varieties of low acid.	Rhubarb.†	Figs—ripe.
Gooseberries.	Unripe pears.	Vinifera (European) grapes.	Overripe fruits.
Eastern grapes.	Ripe quinces (some varieties).	Apricots (ripe).	
Sour varieties of guavas.	Pie melon.		
Grapefruit.*	Sweet prunes.		
Lemons.			
Loganberries.			
Sour oranges.			
Plums (most varieties).			
Sour prunes.			

* Too bitter if used alone, should be mixed with other fruit.
† Not a fruit but suitable for jelly making if pectin is supplied.

What Fruits to Use.—Different varieties of fruits vary greatly in their suitability for jelly making because of differences in pectin and acid content. In table 1, the more common varieties are classified according to their suitability for jelly making.

Fruits rich in pectin and acid are best for jelly. Sour fruit or fruit acid must be added to fruits rich in pectin but lacking in acid. Pectin or a fruit rich in pectin must be added to those deficient in pectin but rich in acid. Fruits deficient in both acid and pectin should not be used, although jelly can be made from them by mixing with them a fruit rich in pectin and acid or by adding acid and pectin.

JELLY MAKING OPERATIONS

Extracting the Juice.—Firm fruits such as apples, quinces, citrus fruits and guavas, should be sliced and boiled with the proper amount of water until soft. Too much water gives a jelly juice that is too thin and must be concentrated by further boiling before it can be used for jelly making; too little water gives a very viscous, muddy juice from which it is difficult to make clear jelly. One pint of water is usually necessary for each pound of apples or quinces, two pints for each pound of oranges or guavas, and five pints for each pound of lemons.

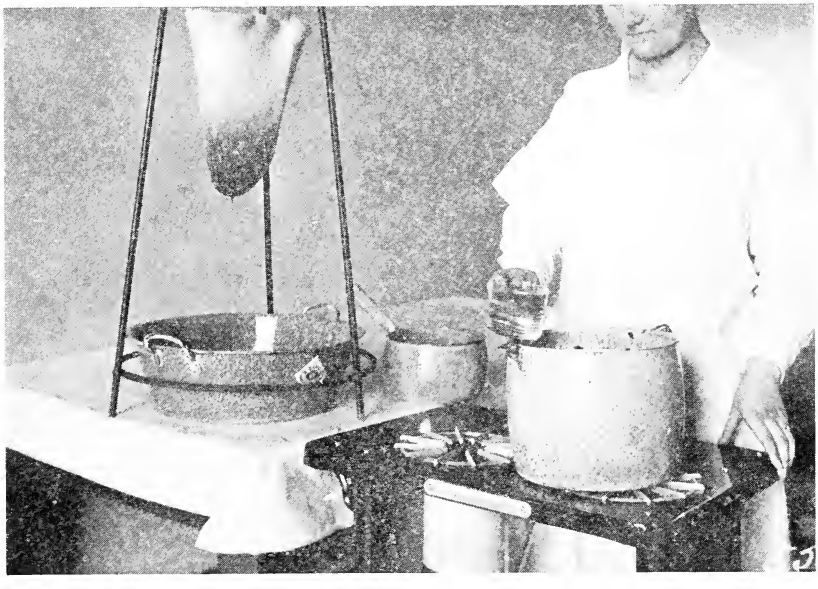


Fig. 1.—Boiling the fruit and straining the juice.

For the first extraction of grapes, currants and berries no water should be added. These fruits should be merely crushed and heated in their own juice.

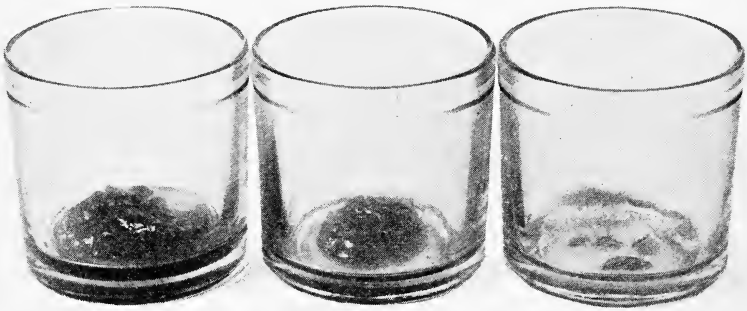
The length of the boiling period should be sufficient to soften the fruit. For apples this will be about fifteen minutes, and for citrus fruits about one hour. Berries should not be boiled longer than from one to three minutes, as prolonged boiling injures the flavor and color and extracts astringent materials from the seeds.

The most practical method of separating the juice and pulp is by straining through a jelly bag. This may consist of a flour or sugar bag or a double thickness of cheesecloth, although a felt jelly

bag made for the purpose is preferable (fig. 1). After draining for an hour the pulp may be pressed to obtain the remaining juice by merely twisting the bag.

The pulp from berries, currants, guavas and other relatively costly fruits can be mixed with sufficient water to prevent scorching and can be boiled a second time to obtain a juice containing sufficient pectin and acid to make jelly of second quality, or it may be mixed with the juice from the first extraction.

Clearing the Juice.—The juice may be made clear either by straining through a felt or flannel bag or by allowing it to settle over night in fruit jars and pouring the clear juice from the sediment. Usually straining is preferable to settling because it is more rapid and just as effective.



No. 1 No. 2 No. 3

Fig. 2.—Pectin precipitates from alcohol test drained free of liquid. No. 1, from juice rich in pectin, very large precipitate. No. 2, from juice moderately rich in pectin, medium amount of precipitate. No. 3, from juice poor in pectin, only a few small pieces of precipitate.

Adding the Sugar.—The amount of sugar to be added is governed by the pectin and acid content of the juice. Pectin is the more important and it is desirable to test the juice for this constituent before adding the sugar. Although it is impracticable to make an accurate pectin analysis in the kitchen, a simple and useful test with denatured alcohol can be made. To make this test, measure one teaspoonful of denatured alcohol into a glass tumbler and add a teaspoonful of the juice. Mix well. In a juice rich in pectin will form a "precipitate" of a single large lump of jelly-like material equal to more than one-half of the total volume of the mixed liquids; in one weak in pectin will form only a few small pieces or strings or none at all. Other juices give precipitates intermediate in volume between these two extremes. Figure 2 shows the different amounts

of precipitate which will be obtained from juices rich, moderately rich and low in pectin. From such a test it is possible, with some experience, to decide approximately how much sugar should be added.

Thus, to a cup of juice very rich in pectin can be added one cup or more of sugar; to one moderately rich in pectin about two-thirds of a cup or less; and to one poor in pectin no sugar should be added until the juice has been concentrated sufficiently by boiling to give a satisfactory pectin test.

Fig. 3.—Sheeting test for jelly and marmalade.

There is no practicable method of accurately determining the acidity of a fruit juice in the home. The only simple guide is the taste and with a little experience it is possible to judge by taste whether or not a juice is sour enough for jelly making. A rough test can be made by comparing the sourness of the juice with that of a mixture of one teaspoon of lemon juice and eight teaspoonfuls of water. The fruit juice should taste at least as sour as the diluted lemon juice.

Lack of acid is easily remedied by the addition of any sour juice or fruit acid. Ordinarily from one-fourth to one-third of a measuring cup of lemon juice or one-half of a teaspoonful of citric acid to a quart of juice will be sufficient to give the required acidity. Citric

acid, which is made from lemons, is wholesome, and may be purchased at any drug store. Tartaric acid, which is made from grapes is equally good and may be substituted for citric acid. It is, however, usually higher in price than citric acid and more difficult to obtain.

Boiling.—The ability to judge when the jelly is done is all-important. The following tests are in general use. They are numbered for convenience of reference.

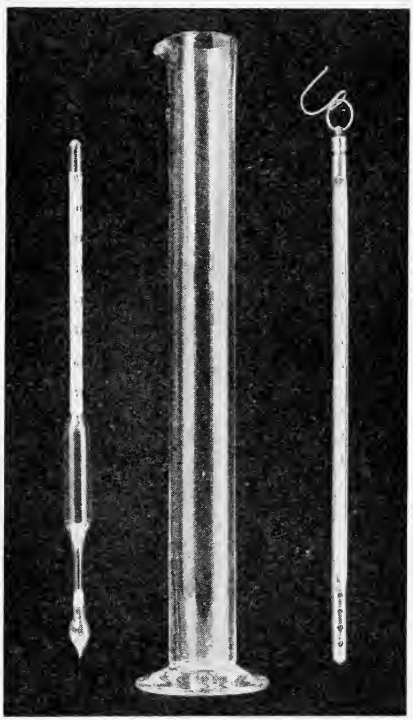


Fig. 4.—Balling hydrometer, hydrometer jar and thermometer.

1. One of the simplest tests consists in allowing the hot liquid to drip from a large cookspoon. At the jellying point it will partially congeal and hang in sheets from the spoon or form two partially congealed drops (fig. 3). With experience this test is fairly reliable.

2. A drop of the liquid placed on a cold plate will show evidence of jellying if the juice has been concentrated sufficiently. This test is not so rapid as the sheeting test.

3. The temperature of the boiling liquid increases in proportion to the concentration and if the juice contains sufficient pectin and acid and if the proper proportion of sugar has been used, the temperature of the boiling liquid at the jellying point will be from

7 to 9° F., above the boiling point of water for any given locality. At sea level this will be 219–221° F., at higher elevations it will be lower because the boiling point of all liquids decreases with increase in elevation.

An accurate chemical thermometer, or household size candy thermometer (fig. 4) and not a cheap unreliable thermometer should be used. The proper method of using the thermometer is illustrated in figure 5.

Fig. 5.—Testing the jellying point with a thermometer. Hydrometer test at left.

4. The density of the boiling liquid increases in proportion to the evaporation, and measurements of the density by means of a Balling, or a Baumé hydrometer may be used to determine the finishing point. If the test is made on the boiling hot juice this will be about 57° to 62° Balling or about 31° to 34° Baumé. Hydrometers may be purchased from any chemical supply firm through a local drug store. The Balling hydrometer is to be preferred because of its greater number of divisions, permitting more accurate reading. A simple Balling hydrometer with a scale of 0–70 can be bought for less than $2.00. A metal or glass cylinder about 1–1¼ inches in diameter and about 10–12 inches deep as shown in figure 4 is also necessary. The Baumé hydrometer recommended has a scale of 0–50°.

Most jelly makers prefer the thermometer test because it is simpler, more rapid and more accurate.

Preliminary Boiling Tests.—It is often desirable to make a preliminary small lot of jelly in order to test in a practical way the jellying quality of the juice.

To make such a test place one cup of the juice in a small stew pan. Add one cup or two-thirds of a cup of sugar, whichever, according to your judgment, is required. Boil until a good sheeting test is obtained or to a boiling point of 8° F., above that of boiling water; in most localities in California 220° F. Pour it into a glass and let it stand one hour. Note the character of the jelly. If it is very stiff use more sugar, if it is very soft or a syrup use less. Ordinarily with undiluted juice from currants, loganberries and sour blackberries, one cup of sugar may be added to a cup of juice, provided *no water has been added to the berries or juice.* Other fruit juices will normally take about two-thirds of a cup of sugar to one of juice.

The composition of the kettle used in boiling jelly is of importance. Aluminum is preferable to agate ware because the former conducts heat rapidly to the top of the pan. The contents is thus heated more evenly and is less apt to scorch. Tin affects the color of red juices and is apt to turn the color to a muddy purple or reddish brown. A broad pan is preferable to a deep one. An aluminum dish-pan is very satisfactory.

Containers.—There are two general kinds of jelly glasses—those in which the jelly is sealed with paraffin and those sealed air tight with special lids. If the jelly is for ordinary home use the paraffin seal will usually answer the purpose. If it is to be sold or is to be stored under unfavorable conditions, such as in a very warm climate or in a damp cellar, an air-tight mechanical seal of some sort should be used.

Ordinary jelly glasses for use with paraffin seals and several forms sealed with screw caps are shown in figure 6. Any of the glasses illustrated can be purchased through a local hardware dealer or grocer.

Filling and Sealing.—Glasses should be cleaned and then scalded to kill mold spores. Pour the jelly into the glasses boiling hot. If the glasses are to be sealed with screw caps, seal them at once and invert to cool so that the hot jelly will sterilize the cap.

If a paraffin seal is to be used, allow the jelly to cool over night. Seal with very hot paraffin; this will sterilize the surface. After pouring the paraffin, insert a knife blade dipped in scorching hot paraffin, to a depth of about ¼ inch between the jelly and the walls

of the glass and pass it around the glass so that some of the paraffin flows into the space thus formed. This will reduce the tendency for the jelly to leak around the edges of the coating.

Paraffin sometimes fails to make an air tight seal; yeast or mold may then enter and cause fermentation "souring" or molding. When this happens the jelly can be safely used if boiled and allowed to cool before it is served.

Store the jelly in a dry, cool place. In a damp location mold frequently forces its way into the jelly around the edges of the paraffin coating.

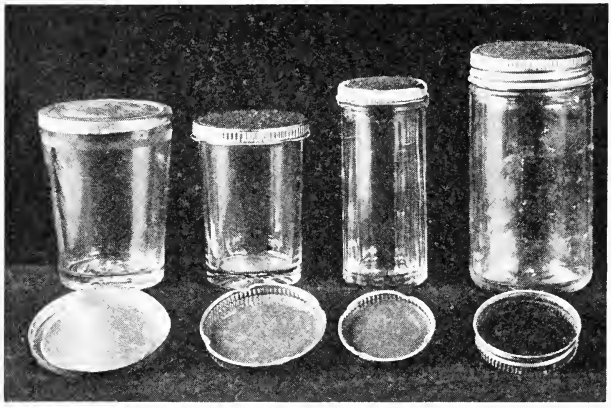


Fig. 6.—Jelly glasses; ordinary glass for paraffin seal at the left; others sealed with screw caps fitted with paper or cork discs.

JELLY RECIPES

A few recipes for the fruits most used in jelly making are given for convenient reference. The sections on general principles of jelly-making operations should be read before attempting to follow the recipes. These sections will also aid in adapting the recipes to other fruits.

Loganberry, Sour Blackberry and Red Currant Jelly.—Use sound, ripe berries or currants. Sort, wash and crush them. Do not add water. Heat slowly to boiling and boil about 3 minutes, then place in a jelly bag and drain until the juice no longer drips from the bag. Return the pulp to the kettle and add enough water to cover. Boil three or four minutes and drain through the jelly bag. A juice of second quality will be obtained which may be combined with the first juice or may be made into a jelly of second quality.

Strain the juice until clear; two or three strainings may be needed.

Determine the pectin content of the juice by the alcohol test (page 7) or if no alcohol is at hand for such a test make a preliminary boiling test (page 11) using one cup of the juice and one cup of sugar. From the pectin test it is possible to estimate the amount of sugar required for the larger lots of juice. Add the volume of sugar indicated necessary by your tests. Boil to the jellying point (page 9). Fill the glasses as directed on (page 11).

Apple Jelly.—Use only sour apples which are firm ripe or slightly underripe. Wash the fruit and slice it in pieces about ⅛ inch thick, without peeling. Add enough water to cover, about one pint to a pound of fruit. Cook slowly until soft, usually about fifteen to twenty minutes.

Strain through a jelly bag until no more juice is obtained or allow to stand overnight. Strain through cloth until fairly clear.

Test the juice for pectin as with berries (page 7). Normally ¾ cup of sugar may be added to a cup of sour apple juice, and ⅔ cup of sugar to a cup of juice of moderate acidity. From this point proceed as with berry jelly.

Plum Jelly.—Use whole, sour plums. Wash the fruit and add one pint of water to a pound of plums, or cover completely with water so that the water comes to about ¼ inch above the plums. Boil until soft—usually fifteen minutes.

Proceed from this point as for berry jelly. A jelly of second quality can be made by boiling the drained or pressed pulp with a second lot of water as directed for berries.

Plum jelly juice from the first boiling prepared as above will require about ¾ cup of sugar to 1 cup of juice—and that from the second boiling about ½ cup of sugar to 1 cup of juice.

Damson plums are among the best, but any of the common table varieties such as Grand Duke, Blue Diamond, Satsuma and Kelsey, if not too ripe, are satisfactory. A mixture of about equal parts of ripe plums to furnish flavor and slightly underripe plums to furnish acid and pectin is very good.

Orange and Lemon Jelly.—Use six lemons and six medium-sized oranges. Slice both fruits about ⅛ inch thick. Measure the sliced fruit and add 1½ cups of water to each cup of fruit. Boil slowly until soft—not less than 45 minutes—usually 60 minutes is best. Allow to drain through a jelly bag over night. If the juice is not clear, strain through flannel or felt.

Use the alcohol test for pectin (page 7), or make a preliminary boiling test (page 11), using one cup of juice and ¾ cup of sugar.

Add to the juice the amount of sugar required as determined by the test and boil to the jellying point (page 9), and treat as directed for berry jelly.

Ordinarily ⅔ to ¾ cup (not more) of sugar may be added to each cup of juice prepared as above.

Other Fruit Jellies.—Other fruits may be made into jelly by modifying the foregoing recipes to suit.

Jelly from Pierce Isabella, Concord and other Eastern varieties of grapes may be made according to the berry jelly recipe; and guavas, quinces and loquats according to the apple jelly recipe. Quinces often require the addition of an equal weight of sour apples to furnish the necessary acidity.

Strawberries may be treated as directed for other berries, except that to the strawberry juice should be added an equal volume of apple or plum juice or the proper amount of pectin or pectin extract.

The Roselle is an annual plant that may be grown in sub-tropical regions such as southern California and the interior valleys. The red calyces (blossoms) are used. To make Roselle jelly, measure the quantity and add an equal volume of water. Boil until soft, strain, and proceed as with berry juices.

Pomegranate juice will not jelly unless pectin or a juice rich in pectin is added. Separate the arils (red "seeds") from the pulp. Press the juice from the arils. Bring to a boil. Strain. Measure and add commercial pectin or pectin syrup, obtainable from any grocery store, in accordance with the directions on the pectin label. Add the proportion of sugar recommended by the pectin manufacturer and boil to the jellying point in the usual manner. Ordinarily one cup of commercial pectin syrup to three cups of pomegranate juice and four cups of sugar will give good results. Pomegranate jelly is very attractive in color and pleasing in flavor.

MARMALADE

As stated elsewhere marmalade is jelly in which pieces of fruit are suspended. The principles of jelly making apply equally to marmalade making. By "marmalade" is usually meant orange marmalade.

Preparing the Juice.—The fruit, usually oranges or a mixture of oranges and lemons, is treated as described elsewhere for preparing jelly. Also see recipe below. The juice is prepared separately from the sliced peel.

Preparing the Sliced Peel or Sliced Fruit.—The sliced peel (usually orange) or sliced whole fruit such as fig or peach is cut very thin. A slicer such as that shown in figure 7 may be used for the purpose. The sliced peel or fruit is then boiled in water until tender. It is then added to the juice.

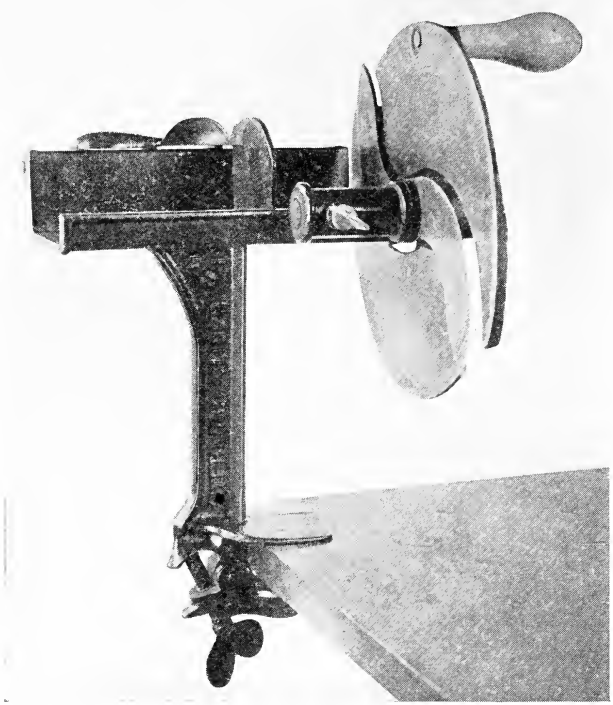


Fig. 7.—Slicer for household use. Suitable for slicing peel for marmalade.

Boiling.—After combining the cooked sliced peel or fruit and the juice, sugar is added as in jelly making and the mixture is boiled to the jellying point (page 9).

It is a good plan to allow the marmalade to stand a few minutes to jelly partially before pouring it into the glasses. This prevents floating of the peel.

Orange Marmalade Recipe.—Use six lemons and twelve large or medium size oranges. Remove the skin in quarters from six of the oranges and set it aside. Slice the lemons and all of the oranges, including those that were peeled, about ⅛ inch thick. Measure the sliced fruit and add about 1½ cups of water to each cup of fruit. Boil the mixture slowly until soft; about 60 minutes, and then drain

through a jelly bag for about 2 hours. Twist the bag to express the remaining juice or allow to drain over night. Strain the juice until clear.

Cut the quartered peels very thin. Boil them in water until tender—20–25 minutes. Drain the peels and discard the water.

Measure the juice. From the above amount of fruit should be obtained 6–7 measuring cups of juice. Test it for pectin as directed on page 7, and add the amount of sugar required. This will usually be one cup of sugar to one of juice. For each 3 cups of juice add about 1 cup of the thinly sliced peel.

Boil until a good jelly test is obtained (page 9). Allow the mixture to stand in the kettle until jellying commences so that the peels will not float. Pour it into dry glasses and seal screw cap glasses hot. If ordinary glasses are used, allow it to stand in the glasses over night and then seal with hot paraffin.

Eight or nine 6-ounce glasses of marmalade should be obtained from a half-dozen lemons and a dozen medium-sized oranges.

DEFECTS AND CAUSES OF FAILURE

Failure to Jelly.—The most common cause of failure to jelly is the use of too much sugar, an error that can be prevented by the proper application of the results of the pectin test. Few juices are rich enough in pectin to require sugar equal in volume or weight to the juice, although with most good jelly juices sugar in the ratio of ¾ : 1 can be used. Where too much sugar has been used, reboil the syrup with unsweetened juice. The amount of unsweetened juice necessary must be determined by trial boilings with small measured amounts of juice and syrup. Usually one-half as much new juice as of syrup will be sufficient. Instead of juice, the proper amount of pectin may be added.

Very prolonged boiling destroys some of the pectin and may prevent jelly formation. If the syrup is still of good eating quality it can be caused to jelly by adding pectin syrup or pectin dissolved in water; or by reboiling rapidly to the jellying point with unsweetened juice.

Lack of acidity is a common cause of failure. The remedy in this case is to add one teaspoonful of citric or tartaric acid to two quarts of juice or add a sour juice, such as lemon, and reboil to the jellying point.

Weeping.—Weeping of unsealed jelly in open glasses is caused by too high a concentration of acid. Mixing with juice low in acid or adding pectin so that more sugar may be added, thus increasing the volume of jelly and decreasing the acidity, are two means of preventing this condition. Cranberry jelly often exhibits this defect.

The weeping of jelly sealed with paraffin is caused by probable fluctuations in volume of the jelly brought about by changes in temperature in the storage room. If, at the time of sealing with paraffin, a knife blade is inserted around the edge of the melted paraffin and the upper one-fourth inch of the jelly, a better union of the paraffin is made with the glass and there will be less danger of syrup being forced out around the edge of the paraffin.

Formation of Crystals.—In grape jelly, crystals of cream of tartar usually form. They are perfectly harmless to the health. They are not so apt to occur if the grape jelly juice is first concentrated about 2:1 by boiling, sealed hot in jars or bottles, and allowed to stand several months to deposit its excess cream of tartar before being made into jelly; or if it is diluted with an equal volume of other good jelly such as sour apple or sour plum. It may also be avoided by adding pectin and diluting with water before adding sugar.

The formation of crystals of cane sugar is caused by over-concentrating the jelly. If such high concentration is required to form jelly, it is an indication that the juice lacks acid or pectin; or that too much sugar for the pectin present has been added.

Tough Jelly.—If too little sugar is used the jelly is apt to be tough. Over-concentration of the jelly is another cause of tough jelly.

Molding.—Molding of jelly sealed with paraffin sometimes occurs. Storing in a damp place favors molding of paraffin coated jelly.

Sealing the jelly scalding hot with an air-tight cap or pasteurizing it in sealed containers will prevent mold. Pasteurizing is accomplished by heating the sealed containers of jelly in water at 180° F., for from 30 to 40 minutes.

Fermentation.—Fermentation or "souring" is caused by yeast and is prevented in the same manner as is molding. Fermentation is more common in warm climates. Jellies of low sugar content, i.e., those that jelly at 217–218° F., are much more liable to ferment than those of high sugar concentration, i.e., those that jelly at 221–222° F., because high sugar concentration retards the growth of yeast.

Fermented jelly is not poisonous but contains some alcohol, which can be driven off by boiling a short time.

HOME MADE JELLY JUICES

Juices from fruits suitable for jelly making may be preserved indefinitely in jars or bottles without sugar and later made into jelly as required. Similarly juices made very rich in pectin by boiling off excess moisture may be prepared and stored in glass containers and used as required to increase the pectin content of fruit juices deficient in this constituent.

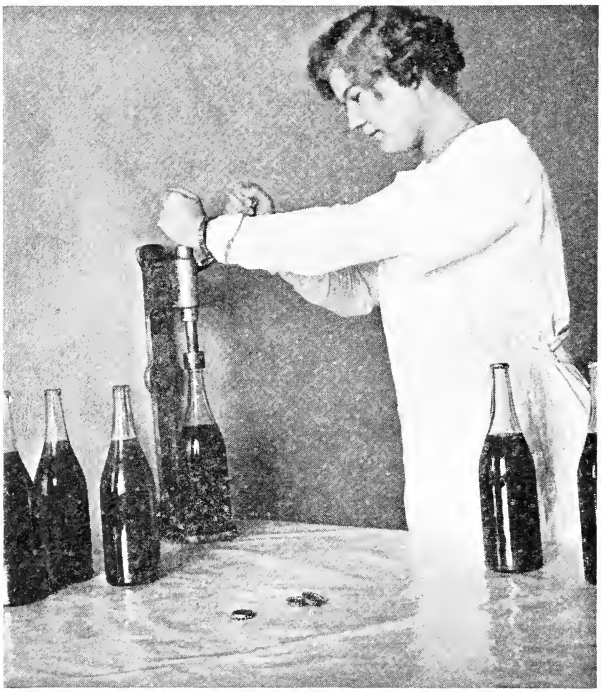


Fig. 8.—Sealing bottles of jelly juice before pasteurizing.

Extracting the Juice.—Loganberries, currants, apples, plums and roselle and guavas are particularly desirable for making jelly juices. The juice from citrus fruits deteriorates somewhat in flavor on standing and is best if used fresh. Prepare the juice exactly as described in the recipes for these fruits on pages 12–14.

Preserving the Juice.—No sugar is added to the juices. They are preserved in one of two ways. In the first method, the juices are heated to boiling and sealed scalding hot in scalded fruit jars. The jars are inverted to cool. No further treatment is required.

In the second method the juices are bottled cold in Crown finish bottles (soda water style), the bottles being filled to within about 1¼ inches of the top. The bottles are then sealed with Crown caps by use of a Crown bottle sealer, as shown in figure 8. Caps and sealer are obtainable from any hardware store. The bottles are then placed on their sides in a large pot or wash boiler with a towel or other heavy cloth beneath the lowermost bottles. Water is added to cover the bottles and is heated to 180° F., the simmering point, for 30 minutes. When the pot and contents are cool enough to handle the bottles may be removed. Store jelly juices in a cool, dark place to avoid loss of color. When the juice is to be used the container is opened and the juice carefully poured from the sediment. It is then used in the same manner as fresh juice.

HOME MADE PECTIN EXTRACTS

These are richer in pectin than the jelly juices previously described. The United States Department of Agriculture recommends[1] the methods described below. These have been tested in our laboratory and found satisfactory.

Apple Pectin Extracts

(*a*) *Choice of Fruits.*—The fruit should be firm, free from decay and worm holes, tart, and hard ripe, rather than mealy.

(*b*) *Preparation of Fruit.*—The apples should be cleaned by thorough scrubbing. A considerable amount of pectin of very satisfactory quality can be extracted from the cores and parings alone, but this extract does not have such a pleasing flavor as that obtained from the whole apples.

(*c*) *Extraction of Pectin.*—Convenient quantities to use are:

4 pounds apples.
4½ pints water for the first extraction.

Slice the apples thin. Place them in a granite or aluminum saucepan only large enough so that the whole mass can be brought quickly to boiling. Cover the pan and boil the mixture rapidly for 20 minutes. Strain the mass through four thicknesses of cheesecloth until the juice ceases to drip.

[1] Denton, Minna C., Ruth Johnstin and Fannie W. Yeatman. Homemade Apple and Citrus Pectin Extracts. U.S.D.A. Circ. 254:1–11, 1923. Obtainable from the Supt. of Documents, Washington, D.C., 5c in coin.

When dripping is complete, remove the fruit from the bag, weigh or measure it, return it to the saucepan, and add an equal quantity of water. Boil again for 20 minutes and strain. The first two extractions should together amount to about 3 quarts. Mix them together in a wide pan, such as a dish-pan, large enough so that the liquid will not be more than 2 inches deep. Heat rapidly until the liquid is reduced to one-fourth of its original volume or to about 1½ pints; this usually requires from 30 to 45 minutes. The concentration should be carried on rapidly, since it is easy to injure the pectin if the boiling process continues for several hours.

To preserve the pectin extract for use with fruits which come at another season, it should be poured while boiling hot into clean jars or bottles which have been standing in boiling water, and sealed at once.

CITRUS PECTIN EXTRACT FROM FRESH PEEL

(*a*) *Choice and Preparation of Fruit.*—Thick-skinned oranges and lemons are best to use for this purpose. The fruit should be washed and wiped dry, and the outer yellow rind, which would impart an undesirable flavor, should be carefully pared off, using a stainless steel, silver or glass knife. It is easier to remove this rind before the fruit is cut than afterwards.

After the yellow skin is removed the white peel is cut off, care being taken that none of the fruit pulp adheres to it.

(*b*) *Extraction of Pectin.*—Convenient quantities to use are:

1 pound fresh white peel.
2 quarts water for each extraction.
3 level teaspoons tartaric acid (or citric acid) for each extraction.

Add the acid to the water and stir until dissolved. Put the fresh peel through a meat grinder, using the coarse blade, then place it in a granite saucepan large enough to permit rapid boiling; cover it with the acid solution. Just before beginning to heat, measure the depth of the material in the pan. This may be done by standing a silver knife or spoon handle upright in it and then noting this depth in inches. Boil the mixture rapidly and stir constantly until the volume is reduced to a little less than half of the originl, measuring the depth as before. Strain it through four thicknesses of cheesecloth and allow it to stand until dripping is complete. The dripping may be hastened a little by pressing the mass lightly with a spoon.

Two more extractions are made in the same way, adding 2 quarts of water and 3 teaspoons of the acid to the pomace each time. It is not necessary, however, to allow the pomace and acid solution to stand for an hour before heating, as it was in making the first extraction.

Mix the three extractions together. If the peel has been cooked according to the directions given, a little less than 1 pint of strained liquid should be obtained as a result of each extraction, and the total amount from a pound of peel should be about 2½ pints. The extract from citrus peel is a thick somewhat syrupy liquid having a pale sediment and no very pronounced flavor. Pectin extracts should always be shaken before using, as the sediment contains much pectin.

Citrus pectin extracts can be stored in much the same way as directed for storing apple pectin extract."

USE OF PECTIN EXTRACTS

The pectin extracts are used to improve the jellying quality of other juices deficient in pectin. Normally ¼ cup of the pectin extract to a cup of other fruit juice is sufficient—but the proportion must be varied to suit conditions. After mixing the extract and the juice, proceed with jelly making as with normal fresh juice.

COMMERCIAL PECTINS

Several excellent pectin syrups and powdered pectins for household use are on the market. When used to improve the jellying properties of natural juices they can be fully recommended. They should not be used, however, to make three or four glasses of jelly where only one glass of jelly would be obtained without their use. Juice which has been so diluted will jelly if pectin is added, but it will be very inferior in flavor and color.

Full directions for the use of commercial pectin preparations accompany the package; no additional directions are necessary.

SCORING JELLIES AND MARMALADES

Competition and judging of home made jellies and marmalades at fairs, Farm Bureau Center meetings, and other occasions affords one of the best means of promoting interest in the home preparation of these products and their improvement. Hard and fast rules should not be followed for all products. Nevertheless a fairly definite

score-card can be used. The one given below has been prepared and used by the United States Department of Agriculture and has been found very satisfactory in our laboratory.

SCORE CARD FOR JELLY (After U.S.D.A. Circular 254)

Kind of Jelly..... Number of Samples.....

	Perfect score	Actual score
1. Package: Glasses of good shape, suitable size, tops clean, tight, free from tarnish; paraffin layer (if any) smooth, no bubbles or breaks; labels suitable, attractive	5	
2. Color: Color natural as determined by the fruit used, no artificial coloring except for mint jelly. Color deepened by wise use of sugar or other sweetener, not darkened by overcooking	10	
3. Clearness: Transparent or translucent, not cloudy or containing pulpy particles. No bubbles or visible crystals. No mold or signs of fermentation. No scum or bubbles at top	10	
4. Texture (judged after glass is opened): Jelly should hold its shape when turned out into a plate; yet should quiver when the plate is moved. Should cut easily with spoon, be tender, yet break with sharp cleavage line, and show sparkling faces. Not sticky, tough, gummy, or brittle; not syrupy; not sugary; no crystals that can be perceived on tongue	40	
5. Flavor: Attractive, pronounced fruity flavor, yet not too sour; nor yet over sweet; not caramelized, nor scorched. Includes odor also. This should not be scorched and should resemble that of the fresh fruit	35	
TOTAL	100	

REMARKS:

OTHER AVAILABLE PUBLICATIONS ON JELLY AND MARMALADE

1. DENTON, MINNA C., RUTH JOHNSTIN and FANNY W. YEATMAN.
Homemade apple and citrus pectin Extracts. U.S. Dept. of Agr. Circ. 254: 1–11, 1923. Obtainable from Superintendent of Documents, Washington, D.C., for 5c in coin; stamps not accepted.

2. CRUESS, W. V., and LAL SINGH.
Marmalade juice and jelly juice from citrus fruits. Univ. of Calif. Agr. Exp. Sta. Circ. 243:1–8. Obtainable from College of Agriculture, Berkeley, California.

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